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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/099,982	03/19/2002	Stephen Randolph Winzer	18180.0115	5514

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EXAMINER	
JUBA JR, JOHN	

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 01/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/099,982	WINZER, STEPHEN RANDOLPH	
	Examiner	Art Unit	
	John Juba	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 October 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-9 and 11-37* is/are pending in the application.

4a) Of the above claim(s) *33-37* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-6,9,21-28,31 and 32* is/are rejected.

7)☒ Claim(s) *7,8,11-20,29 and 30* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 October 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Election/Restrictions

Newly submitted claims 33 – 37 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons. The claims can now be grouped as follows:

Group I - Claims 1 – 32, drawn to ("ABCD") a deformable mirror ("A") with electrical connector ("B"), stiffeners ("C"), and shape retaining elements ("D") for deployment, classified in class 359, subclass 846;

Group II - Claim 33, drawn to ("AB") a deformable mirror without stiffeners or shape retaining elements, classified in class 359, subclass 846;

Group III - Claim 34, drawn to ("ABC") a deformable mirror without shape retaining elements, classified in class 359, subclass 846;

Group IV - Claim 35, drawn to ("ABD") a deformable mirror without stiffeners, classified in class 359, subclass 846; and

Group V - Claims 36 and 37, drawn to ("AD") a deployable mirror without stiffeners or electrical connector, classified in class 359, subclass 846.

Inventions I and II are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP §

806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the claims of Group V evidence that a deformable mirror without the details (connector) of the subcombination is regarded as separately patentable. The subcombination has separate utility such as a deformable mirror which is not deployable, such as in the combination of Group III.

Invention II is related to inventions III - IV as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention II has separate utility such as in a deformable mirror comprising stiffer layers (not requiring stiffeners), in a deformable mirror which is cast with a self-sustaining predetermined base curve (not requiring shape retainer elements). See MPEP § 806.05(d).

Inventions III and I are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the claims of Group V evidence that a deformable mirror without the details (connector or stiffeners) of the subcombination is regarded as separately patentable. The subcombination has separate utility such as a deformable mirror which is not deployable, but has instead a self-sustaining base curve.

Invention III is related to inventions IV and V as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention III has separate utility such as in a deformable mirror which is cast with a self-sustaining predetermined base curve (not requiring shape retainer elements). Invention IV has separate utility as a deployable mirror comprising stiffer layers (not requiring stiffeners). See MPEP § 806.05(d).

Inventions IV and I are related as combination and subcombination (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the claims of Group V evidence that a deformable mirror without the details (connector) of the subcombination is regarded as separately patentable. The subcombination has separate utility such as a deformable mirror having stiffer layers, not requiring the stiffeners of the combination.

Inventions IV and V are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention V has separate utility such as in a deployable mirror which is fully integrated with position sensors and drive electronics, or which is connected with point-to-point wiring (without a connector). See MPEP § 806.05(d).

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

Since applicant has received an action on the merits for the originally presented invention (Group I), this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 33 – 37 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Drawings

The substitute sheet of drawings (Fig. 1) was received on October 14, 2003. This sheet is not approved. Applicant's remark notwithstanding, the replacement sheet apparently was not accompanied by a proposed drawing correction showing the changes (for the examiner's initials). Also, the use of Wite-out™ (or similar correction material which amounts to "erasures", "alterations, overwriting") is not acceptable on formal drawings. If this sheet was to be the proposed correction rather than the replacement sheet, then the changes are not shown in red.

Specification

The disclosure is objected to because of the following informalities. Appropriate correction is required:

The reference number "11" is used in the figures, but not discussed in the specification. Since the illustration is clearly necessary to the understanding of the invention, the identified structure should be described.

The use of the trademark Kapton® has been noted in this application. It should be capitalized wherever it appears *and be accompanied by the generic terminology*, such as "flexible polyimide film, such as that sold under the trademark Kapton®, by E. I. du Pont de Nemours, and Company".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 4 – 6, 9, 21 – 28, 31, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Plante, et al, in view of Lach, et al, and further in view of Williamson, et al. Referring *for example* to Figure 1 and the associated text, Plante, et al disclose a "light-weight" active mirror (Col. 1, lines 7 – 8) comprising:

a first layer (12) having a front side and a back side;

a second layer (10) having a front side (14) and a back side facing the front side of the first layer;

a reflective surface disposed on the front side (14) of the second layer (Col. 3, line 1);

a plurality of electroactive actuator strips (18) arranged between and connected with the first and second layer (via "buttons" 16) operable to alter the curvature of the mirror;

a "connector" (distinguished, in the parlance from "connection"; Col. 4, lines 61 – 67) coupled with the actuator strips an operable to cause the actuator strips to alter the curvature of the mirror (Col. 5, lines 3 – 23); and

a plurality of shape retaining elements (22)(24) attached to the first layer (12) and operable to deploy and bias the mirror in a desired position (Col. 3, line 49 – Col. 4, line 16).

Thus, Plante, et al disclose the invention substantially as claimed. However, Plante, et al disclose a single connector rather than a plurality of connectors, and do not disclose a plurality of stiffening elements operable to stiffen the mirror, as recited.

In the same field of endeavor, Lach, et al disclose an active reflector comprising a molybdenum mesh (Col. 4, lines 45 – 48) or metalized polymeric material (lines 42-44) serving as compliant reflective surface, and a plurality of stiffening elements (11)(12) operable to stiffen the reflective surface. Lach, et al teach that the combination forms a reflective surface deformable under the influence of electroactive actuators cooperating with another layer, and that the resulting assembly is sufficiently light for deployment is space-based applications.

It would have been obvious to one of ordinary skill to replace the second layer of Plante, et al with the flexible reflective layer and stiffeners of Lach, et al in the interest of providing a deformable reflector sufficiently light for deployment in space as taught by Lach, et al. Plante, et al allow that the glass second layer (10) may be replaced with a molybdenum layer (Col. 3, lines 12 – 18) or other composite and intend that the resulting assembly would be suitable for space deployment (Col. 5, line 30). In

selecting one of the flexible reflective layers of Lach, et al, one of ordinary skill would have recognized that the metalized Kapton® was suited for the purposes of Plante, et al, since Williamson, et al demonstrates that metalized Kapton® is known to be suited for use as a space-based optical reflector (Col. 2, lines 1 - 10). It has been held that the selection of a known material based on it suitability for its intended use supports a *prima facie* finding of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.,* 325 U.S. 327; 65 USPQ 297 (1945).

Thus, in light of Williamson, et al, Plante, et al and Lach, et al disclose the invention substantially as claimed, but do not expressly disclose a plurality of connectors connected to the electroactive actuators. Nonetheless, one of ordinary skill would have appreciated that the edge connector of Plante, et al lacks utility unless it is connected to a "mating" connector having electrical continuity with the electroactive actuators, whereby controls signals can be applied to the actuators. In such an arrangement, the combination clearly would have comprised a plurality of connectors connected to the electroactive actuators. Further, one of ordinary skill would have recognized the disclosure in Plante, et al of an edge connector as a teaching to provide a connector as a convenient means of making multiple electrical connections, and that the provision of additional connectors would simply permit connection to a greater number of actuators. Since it has been held that the duplication of structure requires only routine skill in the art, it appears that the provision of more than one edge connector would have been obvious in the interest of permitting facilitating connection to larger mirrors having a greater number of actuators.

With regard to claims 2 and 4, Plante, et al teach that the "first" (12) and "second" (10) layers may be of the same material, as long as the second layer (10) is more flexible than the first. Thus, it appears that the selection of the polymer film and stiffeners of Lach, et al for use in the first layer (12) would have been a rather obvious matter of selecting a thickness and a stiffness greater than those used in the second layer.

With regard to claims 5 and 6, Lach, et al teach a mesh (5) of coated carbon members (Col. 4, lines 52 – 58) extending across the entire mirror. The examiner believes that the "wires" referred to by Lach, et al fairly constitute "rods" in the broadest sense.

With regard to claims 21 – 24 and 28, Plante, et al expressly teach that the mirror is to be used to correct for aberrations attributable to thermal gradients, atmospheric turbulence, dust, *etc.* (Col. 1, lines 18 – 23) and that it is to be connected to the wavefront sensing system of Hardy (U.S. Patent number 3,923,400). Since the Hardy patent is incorporated by reference into the disclosure of Plante, et al, Plante, et al disclose all of the teachings of Hardy, including the real-time wavefront sensing system and feedback loop. With particular regard to claim 24, Plante, et al do not disclose spacecraft vibrations. Nonetheless, it is believed that actuators "operable to" correct the aforementioned aberrations inherently are "operable to" correct aberrations due to spacecraft vibrations, at least to some extent.

With regard to claims 25 – 27, the piezoelectric actuators disclosed by Plante, et al inherently are responsive to an applied voltage to effect dimensional changes. The

actuators must be operated either alone or in groups, since the two cases are the only (mutually exclusive) possibilities.

Allowable Subject Matter

Claims 7, 8, 11, 12, 13 – 20, 29, and 30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art, taken alone or in combination, fails to teach or to fairly suggest the *combination* wherein

the first layer thickness is 2 – 10 μm, as variously recited in claims 7 and 8;

the second layer thickness is 1 – 5 μm, as variously recited in claims 11 and 12;

the shape retaining elements comprise strips symmetrically arranged on and *extending* substantially entirely across the front side of the first layer, as recited in claim 13;

the shape retaining elements comprise a shape-memory alloy, as recited in claims 14 and 15;

the connectors are arranged in the manner particularly recited in claims 16 – 18;

the mirror thickness is 9 – 12 μm, as variously recited in claims 19 and 20; or wherein

the mirror has an average density of about 2 – 5 g/cc, as variously recited in claims 29 and 30.

Response to Amendment

It is now clear that a plurality of electroactive actuator strips are indeed illustrated, and the previous objection to a lack of illustration of this feature is *withdrawn.* Insofar as illustration of the "ring" structure is not necessary for an understanding of the invention *as claimed,* the drawing objection for a lack of illustration is *withdrawn.* The remaining drawing informalities are noted above. It is noted that removal of the reference character as proposed *would be* approved as overcoming an informality in the specification as well.

Applicant's amendment to the specification is noted with appreciation as overcoming much of the previous objection and as lending greater clarity to the disclosure. The remaining informalities are set forth above.

In light of Applicant's remarks and amendment to the specification, the rejection of claims 1, 2, 4 – 9, and 11 – 32 under 35 U.S.C. §112, second paragraph is *withdrawn.* In light of the specification, these claims meet the clarity requirement. The cancellation of claims 3 and 10 renders their previous (further) rejection moot.

Applicant's amendment of claim 1 is sufficient in overcoming the previous rejection of claims 1, 2, 4, 6 – 9, 11 – 15, 19 – 22, 24, 27, and 29 – 32 under 35 U.S.C. §103(a) as being unpatentable over Williamson, et al, in view of Elliot, et al, and further in view of Maclean, et al. [The cancellation of claims 3 and 10 obviates their continued rejection on these grounds.] In light of the teachings of Maclean, et al, it appears that the actuators (tendons) would have been embedded in a layer of the prior art, rather than "arranged between and connected with the first layer and the second layer", as

now recited. Although Elliot, et al *appear* to teach (primarily by way of illustration) actuators applying coactive forces to two layers, and despite an *express suggestion to combine* the tendons of Maclean, et al with *an adaptive reflector,* it is believed that one of ordinary skill would *not* have regarded Maclean, et al as teaching connection of electroactive actuators in the manner now recited.

Lach, et al do not suggest connection of the actuators to the "first" and "second" layers identified in Williamson, et al. Accordingly, the rejection of claim 5 under §103(a) as being unpatentable over Williamson, et al, in view of Elliot, et al and Maclean, et al, and further in view of Lach, et al has been overcome by the recitation of this feature in the base claim.

Plante, et al and Hardy do not suggest connection of the actuators to the "first" and "second" layers identified in Williamson, et al. Accordingly, the rejection of claims 23 and 28 under §103(a) as being unpatentable over Williamson, et al, in view of Elliot, et al, and Maclean, et al, and further in view of Plante, et al and Hardy has been overcome by the amendment to claim 1.

Applicant's amendment of claim is sufficient in overcoming the previous rejection of claims 1, 2, 4, 6 – 9, 11 – 13, 16 – 22, 24 – 27, and 29 - 32 under §103(a) as being unpatentable over Williamson, et al, in view of Elliot, et al, and further in view of Melzer, et al. [The cancellation of claims 3 and 10 obviates their continued rejection on these grounds.] Melzer, et al teach placement of the actuator *across the surface* of a single mirror layer, and do not suggest actuators between and "connected with" two layers.

Although one might infer from the illustration in Elliot, et al that actuators are to situated between and connected with two layers, such a teaching would require the actuators to apply force between two layers. [Such an inference is reasonable since the actuators are identified with separate lead-lines directed to "arrows" customarily indicative of applied force. Given the schematic nature of the drawings, it is believed that multiple in-plane actuators would have been identified by separate lead-lines, alone, or with in-plane arrows.] Since Melzer, et al do not disclose an arrangement of actuators applying force between two layers, there appears to have been no clear suggestion that the actuators of Melzer, et al would have been suitable for use in the manner reasonably suggested by Elliot, et al or in the manner now recited.

Lach, et al do not suggest connection of the actuators to the "first" and "second" layers identified in Williamson, et al. Accordingly, the rejection of claim 5 under §103(a) as being unpatentable over Williamson, et al, in view of Elliot, et al and Melzer, et al, and further in view of Lach, et al has been overcome by this feature now recited in claim 1.

Likewise, Plante, et al and Hardy do not suggest connection of the actuators to the "first" and "second" layers identified in Williamson, et al. Accordingly, the rejection of claims 23 and 28 under §103(a) as being unpatentable over Williamson, et al, in view of Elliot, et al, and Melzer, et al, and further in view of Plante, et al and Hardy has been overcome by the amendment of claim 1.

As discussed above, the teachings of Melzer, et al and Maclean, et al are directed to in-plane actuators. Thus, modification as suggested by these references

would not have lead to the invention as now recited. Accordingly, the rejection of claims 14 and 15 under §103(a) as being unpatentable over Williamson, et al, in view of Elliot, et al and Melzer, et al, and further in view of Maclean, et al has been overcome by amendment.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Bennett, et al (U.S. 2003/0147162 A1) disclose an adaptive mirror comprising two layers and actuators between and connected with the two layers.

R.E. Aldrich (ADAPTIVE OPTICS ENGINEERING HANDBOOK) illustrates electrical connectors in combination with adaptive mirrors (Figs. 8 and 10).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (703) 308-4812. The examiner can normally be reached on Mon.-Fri. 9 - 5.

On or about January 20, 2004, the examiner's new phone number is expected to be (571) 272-2314 at the Alexandria campus.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Drew Dunn can be reached on Mon.- Thu., 9 - 5.

The centralized fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306 for *all* communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JOHN JUBA
PRIMARY EXAMINER
Art Unit 2872

December 31, 2003